The Testing Effect: Experimental Evidence from a College Course

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Background

• The testing effect occurs when intervening tests (quizzes) on target material enhance performance on a later (final) test.
• Though the testing effect has been demonstrated in laboratory experiments (see Roediger & Karpicke, 2006a for a review), little research has examined whether the testing effect emerges in classroom settings.
• This study examines whether the testing effect can be generalized to the college classroom where there exists the significant potential for improving student learning.

Methods

Participants:
• Twenty-one incoming freshman at a mid-western university enrolled in a five-week Introduction to Psychology course.

Design:
• 2 x 2 x 2 within-subjects design
  – Intervening test (quizzed, not quizzed)
  – Question stem (same worded, different worded)
  – Exam question type (multiple choice, short answer)

Materials:
• Quizzes (12 short answer questions for each quiz)
  – 8 asked as multiple choice on exams (4 same worded; 4 different worded)
  – 4 asked as short answer on exams (2 same worded; 2 different worded)
• Exams (40-50 multiple choice, 16 short answer)
  – 16 multiple choice & 8 short answer previously quizzed by any group
  – 16 multiple choice & 8 short answer not quizzed but yoked to tested material

Procedure:
• Subjects attended class 5 days/week for 1 hour 45 minutes per day. Quizzes were administered through email twice per week; subjects submitted answer through email and received immediate feedback. Unit exams were given during class once per week. Tested material was counterbalanced across 4 groups such that each particular group was exposed to ¼ of the tested material.

Results

Exam Performance:

Proportion of Correct Responses on Unit Exams as a function of quizzing, exam question type, and match of quiz and exam question stems

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<tbody>
<tr>
<td>Multiple Choice</td>
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<td>0.97</td>
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<tr>
<td>Short Answer</td>
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<td>0.83</td>
<td>0.82</td>
<td>0.81</td>
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Figure 1. Better exam performance for quizzed items: question stem interacts with exam question type for short answer, but not multiple choice.

Effect of Feedback:

Proportion of correct items on the quizzes that were answered correctly on the unit exams compared to matched unquizzed items as a function of quizzing, question type, and match of quiz and exam question stems

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<tr>
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<tr>
<td>Short Answer</td>
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Figure 3. Significant interaction between quizzing and match of quiz and exam question stems: quizzing only slightly improved initially missed multiple choice question, while exam performance fared worse for initially missed short answer questions.

Conclusions

• There was a testing effect.
• For multiple choice exam questions, there was a significant advantage of quizzing for both same and different stem questions.
• For short answer exam questions, there was a significant advantage of quizzing for same stem questions, but not for different stem questions.
• Questions answered correctly on the quizzes yielded significantly higher exam performance relative to unquizzed questions regardless of exam question type and question stem.
• For questions answered incorrectly on the quizzes, only multiple choice exam questions resulted in slightly better exam performance relative to nonquizzed items: for SA exam questions, quizzed items fared worse. Students may not process feedback administered through email.

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References